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For: Public Comment

Subject: Retro-commissioning Compliance

P O S I T I O N P A P E R

Background

Commissioning Requirements for Existing Buildings

In order to remain eligible to request state-aid for school capital projects under AS 14.11, Alaska school districts must have a preventive maintenance and facility management program in compliance with 4 AAC 31.013(a), including:

(2) an energy management plan that includes . . .

(B) regular evaluation of the effectiveness of and need for commissioning existing buildings.

This requirement was codified in regulation on November 29, 2019 and it is the intent of the Department of Education & Early Development to assess district compliance with the regulation during the period November 1, 2020 and June 1, 2021. The department, following review at the Bond Reimbursement & Grant Review Committee, is establishing the criteria (i.e., Options) outlined in this paper for energy performance measurement. The department is also making tool(s) available for district use to assist them in meeting the established criteria under Option 2. The department is seeking comment on both the published criteria and the compliance tools.

Definitions

Retro-commissioning (RCx): RCx is the inspection and adjustment of systems to return the facility to operate as it was designed to operate. Generally, it is assumed to apply to facilities that were never commissioned at start-up. The parallel term “re-commissioning” is sometimes applied to commissioning activity that follow an original (prior) commissioning event.

Energy Use Intensity (EUI): Sometimes also referred to as Energy Utilization Index, the EUI provides a snapshot of the quantity of energy actually used by a building on a square foot and time period basis (e.g. month, year). The calculation converts the total energy usage for a determined time period from all sources in the building, (e.g. heating fuel, electrical) into British Thermal Units (BTUs). The total usage is then divided by the number of square feet (sf) of the building. EUI units are kBtus/sf for any measured time period. As stand-alone metric, EUIs are not adjusted for climate variations.

British Thermal Unit (BTU): A BTU is the amount of heat required to raise the temperature of one pound of liquid water by one degree Fahrenheit at a constant pressure of one atmosphere.

Heating Degree Day (HDD): HDDs are a measure of how much (in degrees), and for how long (in days), the outside air temperature falls below 65 degrees Fahrenheit. It is commonly used in calculations relating to the energy consumption required to heat buildings. Essentially, the colder the outside air temperature, the more energy it takes to heat a building. The idea is that the amount of energy needed to heat a building in any day/week/month/year is directly proportional to the number of heating degree days in that day/week/month/year.

Site Energy: The amount of primary (e.g. oil, natural gas) and secondary energy (e.g. heat and electricity) consumed by a building as reflected in utility bills and other on-site measurements. Site energy is calculated by converting each fuel source into BTUs, then adding them altogether. Site energy is useful in monitoring how the energy use for an individual building has changed over time; however, it is not a good metric to compare two different buildings.

Discussion

The regulation language requires three actionable steps of school districts:

- 1) Districts must evaluate the need for commissioning of existing buildings;
- 2) Districts must evaluate the effectiveness of retro-commissioning existing buildings;
- 3) The evaluation must be regular.

Retro-commissioning Need

The department proposes that districts evaluate the need for retro-commissioning by measuring the EUI for each designated facility (see RCx Target Facilities). The calculated EUI would then be used to establish a performance benchmark for each facility. A retro-commissioning need would be triggered when the EUI fell below the benchmark. The process of establishing the benchmark would depend on the compliance option selected (see Options). For example, under Option 2, the EUI would be adjusted for climate variations using Degree Days, and finally, compared against a statewide minimum EUI benchmark established by the department and updated as needed as part of the CIP application process.

Retro-commissioning Effectiveness

The department proposes that districts evaluate the effectiveness of implementing retro-commissioning on a school facility by calculating an anticipated Return on Investment (ROI) for the retro-commissioning effort. This ROI would be a simple payback calculation comparing the anticipated cost of the RCx and its recommendations, to the estimated cost savings resulting from implementing the RCx recommendations. Any ROI showing a simple payback within four years would be considered effective. Information from industry sources indicate a cost range for a full RCx—planning, implementation, and verification—of \$0.13/sf to \$2.00/sf with the planning phase requiring \$0.05/sf to \$0.50 of those costs. (Lawrence Berkeley National Laboratory). Many areas of Alaska would have to add approximately \$2000 additional in base costs for travel and per-diem.

Industry indicators suggest energy savings from recommissioning to be between 5 and 20 percent. A published study of 224 buildings in 21 states found the average energy savings to be

15 percent. Absent a more sophisticated analysis, the department proposes evaluating the effectiveness of RCx on any building by using the following calculation:

Planning cost (PC) = \$0.50/sf + \$2000

Implementation cost (IC) = \$0.50/sf * Cost Model geographic cost factor

Anticipated annual savings (AAS) = 7 percent of electricity and fuel costs.

RCx Effectiveness Calculation: $PC + IC < AAS$

Regular Evaluation

The department proposes that a regular evaluation would be an annual evaluation. At a consistent date, established in the district's energy plan, each qualifying school facility would be evaluated for RCx on a consumption-based EUI analysis, and RCx effectiveness based on a cost-based ROI analysis. Ideally this data would be gathered into a report and shared with the district school board.

RCx Target Facilities

Retro-commissioning is an operating budget cost aimed at creating an operational cost savings. The purpose of RCx is not to identify capital renewal needs related to operational costs—that work falls to the more expansive Energy Audit. A retro-commissioning event, therefore, should only be implemented when a reasonably quick return on investment from operating funds can be anticipated.

Regular evaluation of the need for, and effectiveness of retro-commissioning may not be necessary for every building. In determining the target facility for retro-commissioning, several factors should be considered as follows: 1) the use type of the facility, 2) the total annual energy consumed (correlated as a building's size), 3) the age of its primary energy-influenced building systems (ref. DEED Renewal & Replacement (R&R) Schedule categories listed below), and 4) the presence of an integrated building automation system. Using these four factors the department is proposing the following facilities be included as "existing buildings" under the requirements of 4 AAC 31.013(a)(2)(B).

Each facility designated as a 'main school' in the DEED Facilities Database, along with any other support facility greater than 5000gsf, which meet each of the following building system criteria:

a.	Exterior Walls System	Installation or renewal within 25 years
b.	Roof Systems	Installation or renewal within 25 years
c.	HVAC Distribution	Installation or renewal within 40 years
d.	HVAC Equipment	Installation or renewal within 30 years
e.	HVAC Controls	Installation or renewal within 20 years
f.	Electrical Lighting	Installation or renewal within 25 years

Responses and Tools

Each district will need to update its energy management plan to include details about the effectiveness and the need analyses for retro-commissioning. Districts will need to implement the measurements and calculations using tools that they have developed, using commercially

available tools, or using tools supplied by DEED. Proposed DEED tools are attached to this briefing paper. An equally viable tool option would be to use the US Environmental Protection Agency's Energy Star Portfolio Manager. This tool takes utility consumption data and calculates an EUI for the facility. One benefit of tracking and evaluating using the EPA tool is the access it provides to comparative data from other K-12 school facilities.

Options

Option 1 – District Tools/District Metrics:

Under this option, a district would demonstrate compliance with the regulation requirements by asserting its own retro-commissioning needs evaluation (EUI-based), effectiveness assessment, and regularity with an annual minimum. (Note: this could include independent use of the EPA Portfolio Manager identified in Option 3 below.)

Option 2 – Department Tools/Department Metrics:

Under this option, a district would demonstrate compliance with the regulation by using the DEED-supplied retro-commissioning needs evaluation, and effectiveness assessment tools on an annual basis. (See attached template and sample tool.)

Option 3 – Department/District Collaboration Using EPA's Portfolio Manager

Under this option, districts and the department would collaborate and adopt the EPA Energy Star platform as the process for demonstrating compliance with the regulation in the area of retro-commissioning needs evaluation, and effectiveness assessment. An integrated process would look something like the following:

- Establish baseline annual energy use by location
 - Establish an EPA Portfolio Manager account for DEED (free)
 - Enter DEED Model School info into EPA Portfolio Manager, once for each representative community in the partnering district
- Establish recommended Targets for EUI performance
 - Can be individual community based
 - EPA Target Finder online tool is used for this, dovetails with baseline info above
- Establish metrics for effectiveness of RCx
 - No tool provided in Portfolio Manager
 - Use Option 2 default or DEED-accepted alternative
- Each school district would track their specific building energy use using their own Portfolio Manager account, and compare to the above Targets